



# National Voluntary Laboratory Accreditation Program



## SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

### ORNL Metrology Laboratory

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### CALIBRATION LABORATORIES

NVLAP LAB CODE 200659-0

NVLAP Code: 20/A01

ANSI/NCSL Z540-1-1994; Part 1

Compliant

### ELECTROMAGNETICS - DC/LOW FREQUENCY

NVLAP Code: 20/E02

AC Current Output

Range in A	Best Uncertainty ( $\pm$ ) in A <sup>note 1</sup>						Remarks
	10	20	40	1 k	5 k	10 k	
0.00022	1.16 E-06	1.16 E-06	5.78 E-07	3.05 E-07	4.19 E-07	4.19 E-07	Source / Measure
0.0022	1.16 E-05	1.16 E-05	5.78 E-06	3.03 E-06	4.19 E-06	4.19 E-06	Source / Measure
0.022	1.16 E-04	1.16 E-04	5.78 E-05	3.02 E-05	4.13 E-05	4.13 E-05	Source / Measure
0.22	1.16 E-03	1.16 E-03	6.01 E-04	4.63 E-04	9.37 E-04	9.37 E-04	Source / Measure
2.2		1.16 E-03	1.39 E-03	1.39 E-03	9.43 E-03	9.43 E-03	Source / Measure
11.0			2.91 E-02	2.95 E-02	3.59 E-02	3.67 E-02	Source / Measure

2006-10-01 through 2007-09-30

Effective dates

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*NVLAP Code:* 20/E05

2 Wire Resistance

<i>Range in <math>\Omega</math></i>	<i>Best Uncertainty (<math>\pm</math>) in <math>\Omega</math> <sup>note 1</sup></i>	<i>Remarks</i>
0	2.89 E-01	Source / Measure
1	2.89 E-01	Source / Measure
1.9	2.89 E-01	Source / Measure
10	2.89 E-01	Source / Measure
19	2.90 E-01	Source / Measure
100	2.91 E-01	Source / Measure
190	2.92 E-01	Source / Measure
1 k	3.01 E-01	Source / Measure
1.9 k	3.19 E-01	Source / Measure
10 k	4.18 E-01	Source / Measure
19 k	5.89 E-01	Source / Measure
100 k	1.63 E + 00	Source / Measure
190 k	6.04 E + 00	Source / Measure
1 M	2.31 E + 01	Source / Measure
1.9 M	2.27 E + 02	Source / Measure
10 M	7.31 E + 02	Source / Measure
19 M	1.21 E + 04	Source / Measure
100 M	5.92 E + 04	Source / Measure

4 Wire Resistance

0	6.56 E-05	Source / Measure
1	9.59 E-05	Source / Measure
1.9	1.40 E-04	Source / Measure
10	2.69 E-04	Source / Measure
19	9.39 E-04	Source / Measure
100	2.11 E-03	Source / Measure
190	3.11 E-03	Source / Measure
1 k	1.31 E-02	Source / Measure
1.9 k	3.10 E-02	Source / Measure

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10 k	1.31 E-01	Source / Measure
19 k	2.96 E-01	Source / Measure
100 k	1.37	Source / Measure
190 k	5.76 E + 00	Source / Measure
1 M	2.28 E + 01	Source / Measure
1.9 M	2.27 E + 02	Source / Measure
10 M	7.31 E + 02	Source / Measure
19 M	1.21 E + 04	Source / Measure

**NVLAP Code:** 20/E06  
DC Voltage

<i>Range in V</i>	<i>Best Uncertainty (±) in V<sup>note 1</sup></i>	<i>Remarks</i>
0	9.33 E-07	Source / Measure
0.22	3.27 E-06	Source / Measure
2.2	2.20 E-05	Source / Measure
11	1.52 E-04	Source / Measure
22	2.92 E-04	Source / Measure
220	2.73 E-03	Source / Measure
1100	1.26 E-02	Source / Measure

**NVLAP Code:** 20/E06  
DC Voltage Fixed Points

<i>Range in V</i>	<i>Best Uncertainty (±) in V<sup>note 1</sup></i>	<i>Remarks</i>
0.1	1.22 E-06	Source / Measure
1	3.65 E-06	Source / Measure
10	2.46 E-05	Source / Measure
100	3.33 E-04	Source / Measure
1000	4.16 E-03	Source / Measure

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NVLAP LAB CODE 200659-0

NVLAP Code: 20/E06

DC Current

Range in A	Best Uncertainty ( $\pm$ ) in A <sup>note 1</sup>	Remarks
0	3.47 E-09	Source / Measure
0.00022	1.38 E-08	Source / Measure
0.0022	1.14 E-07	Source / Measure
0.022	1.45 E-06	Source / Measure
0.22	3.75 E-05	Source / Measure
2.2	2.74 E-03	Source / Measure
11.0	4.89 E-03	Source / Measure

NVLAP Code: 20/E09

LF AC Voltage

Range	Best Uncertainty ( $\pm$ ) in % + $\mu V$ <sup>note 1</sup>							
	Frequency in Hertz							
	10 to 20	20 to 40	40 to 20 k	20 k to 50 k	50 k to 100 k	100 k to 300 k	300 k to 500 k	500 k to 1 M
2.2 mV	0.209 + 4	0.209 + 4	0.18 + 4	0.808 + 4	1.697 + 5	1.680 + 10	1.680 + 10	1.683 + 20
22 mV	0.036 + 4	0.036 + 4	0.047 + 4	0.047 + 4	0.105 + 4	0.406 + 5	1.214 + 10	1.215 + 20
220 mV	0.034 + 12	0.032 + 7	0.032 + 7	0.047 + 7	0.105 + 07	0.405 + 17	1.214 + 20	1.215 + 25
2.2 V	0.034 + 40	0.032 + 15	0.032 + 15	0.046 + 8	0.104 + 10	0.404 + 30	1.213 + 80	1.214 + 200
22 V	0.048 + 400	0.047 + 150	0.047 + 150	0.052 + 50	0.150 + 100	0.150 + 200	1.790 + 600	1.791 + 2000

  

Range	Best Uncertainty ( $\pm$ ) in % + mV <sup>note 1</sup>							
	Frequency in Hertz							
	10 to 20	20 to 40	40 to 20 k	20 k to 50 k	50 k to 100 k	100 k to 300 k	300 k to 500 k	500 k to 1 M
220 V	0.071 + 4	0.070 + 1.5	0.070 + 1.5	0.150 + 0.6	0.358 + 1	0.358 + 2.5	1.749 + 16	1.777 + 40
1100 V	0.067 + 16	0.053 + 4	0.053 + 3.5					

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### TIME AND FREQUENCY

*NVLAP Code:* 20/F01  
Frequency Dissemination

<i>Range in Hz</i>	<i>Best Uncertainty (±) (Fractional Frequency Error) <sup>note 1</sup></i>	<i>Remarks</i>
10 M	$1.07 \times 10^{-11}$	GPS Master Oscillator

### MECHANICAL

*NVLAP Code:* 20/M05  
Flow Rate

<i>Range</i>	<i>Best Uncertainty (±) <sup>note 1</sup></i>	<i>Remarks</i>
0.1 SLPM to 1.0 SLPM	0.6 % of Reading + 0.01 % FS	Laminar
3.0 SLPM to 30 SLPM	0.6 % of Reading + 0.01 % FS	Laminar
28 SLPM to 100 SLPM	0.5 % of Reading + 0.01 % FS	Sonic
67 SLPM to 250 SLPM	0.5 % of Reading + 0.01 % FS	Sonic
248 SLPM to 1000 SLPM	0.5 % of Reading + 0.01 % FS	Sierra
3 sccm to 40 000 sccm	0.56 % of Reading	

### THERMODYNAMIC

*NVLAP Code:* 20/T05  
Pressure  
Absolute Mode

<i>Range</i>	<i>Best Uncertainty (±) in ppm of Reading + mPa (psi) <sup>note 1</sup></i>	<i>Remarks</i>
1.0 pA to 15 kPa	37 + 8	FPG 8601
0.000145 psia to 2.17 psia	37 + (1.2 E-6)	FPG 86.01

<i>Range</i>	<i>Best Uncertainty (±) in ppm of Reading <sup>note 1</sup></i>	<i>Remarks</i>
13.8 kPa to 34.5 kPa	98.3	2465
2.0 psia to 5 psia	98.3	2465
34.5 kPa to 172.4 kPa	43.2	2465

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5 psia to 25 psia	43.2	2465
82.7 kPa to 3447.4 kPa	25.2	2465
12 psia to 500 psia	25.2	2465
165.5 kPa to 6894.8 kPa	21.4	2465
24 psia to 1000 psia	21.4	2465

### Absolute Differential Mode

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm of Reading + mPa (psi) <sup>note 1</sup></b>	<b>Remarks</b>
0 Pa to 15 kPa	37 + 5	FPG 8601
0 psia to 2.17 psia	37 + (7.3 E-7)	FPG 8601

<b>Gauge Mode</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm of Reading + mPa (psi) <sup>note 1</sup></b>	<b>Remarks</b>
0 Pa to 15 kPa	37 + 5	FPG 8601
0 psi to 2.17 psi	37 + (7.3 E-7)	FPG 8601

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Remarks</b>
5.5 kPa to 172.4 kPa	19.3	2465
0.8 psig to 25 psig	19.3	2465
82.7 kPa to 6894 kPa	19.8	2465
12 psig to 1000 psig	19.8	2465
1.379 MPa to 68.948 MPa	108	5202
200 psig to 10 000 psig	108	5202

**NVLAP Code:** 20/T07  
Resistance Thermometry

<b>Range in °C</b>	<b>Best Uncertainty (<math>\pm</math>) in mK</b>	<b>Remarks</b>
0.01	1.0	TPW
29.7646	2.0	GaMP
231.928	4.0	Sn FP
419.527	8.0	Zn FP

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1. Represents an expanded uncertainty using a coverage factor,  $k = 2$ , at an approximate level of confidence of 95 %.

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